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Physical Activity in Middle-aged and Young-old Adults The Roles of Self-efficacy, Barriers, Outcome Expectancies, Self-regulatory Behaviors and Social Support

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Keywords
middle age, physical activity, social cognitive theory, young-old adults

Disciplines
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Physical Activity in Middle-aged and Young-old Adults

The Roles of Self-efficacy, Barriers, Outcome Expectancies, Self-regulatory Behaviors and Social Support

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Abstract

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Keywords

- *middle age*
- *physical activity*
- *social cognitive theory*
- *young-old adults*

DESPITE widespread efforts, the percentage of adults who engage in regular physical activity is low and has remained stable over time (US Department of Health and Human Services [USDHHS], 2007). In fact recent data suggest that only 30 percent of Americans between the ages of 45 and 64, 26 percent of those aged 65–74, and 17 percent of adults over the age of 75 reported engaging in regular leisure time physical activity (USDHHS, 2007). The Surgeon General reported that 30–50 percent of adults over the age of 50 do not engage in any leisure-time physical activity (US Surgeon General's Report, 1996). Unfortunately, most physical activity interventions result in only modest increases in the level of activity (Eakin, Glasgow, & Riley, 2000). Therefore, a more thorough understanding of the psychological and social determinants of engaging in physical activity is important so that interventions can maximize the likelihood of success.

The social cognitive theory (Bandura, 1997) provides a framework that simultaneously addresses self-efficacy, social support, perceived barriers, outcome expectancies and self-regulatory behaviors. Research suggests that the factors included in the social cognitive theory account for much of the variance in a variety of health behaviors, including physical activity (e.g. Resnick, Palmer, Jenkins, & Spellbring, 2000). In addition, the social cognitive theory provides a foundation on which behavioral interventions can be based and includes a number of potential targets for interventions (Bandura, 1997).

Self-efficacy is the primary determinant of the social cognitive theory (Bandura, 1997, 2004) and is one of the strongest psychosocial correlates of physical activity and exercise (e.g. Netz & Raviv, 2004; Resnick et al., 2000; Rogers et al., 2005; Sherwood & Jeffery, 2000). In general, self-efficacy reflects a person's beliefs about what he or she can accomplish with available resources in a variety of situations, and not necessarily the number of skills or resources he or she has (Bandura, 1997). That is, even highly skilled individuals with abundant resources can perform poorly if they doubt their ability (Bandura & Jourden, 1991). Self-efficacy is directly (McAuley, Jerome, Elavsky, Marquez, & Ramsey, 2003) and indirectly related to physical activity (Resnick et al., 2000). Most studies that use the social cognitive theory as a framework suggest that the indirect effect of self-efficacy on physical activity is through three constructs: (1) perceived barriers (Rovniak, Anderson, Winett, & Stephens, 2002); (2) self-regulatory behavior (Dishman et al., 2005); and (3) outcome expectancies (Petosa, Suminski, & Hortz, 2003).

Perceived barriers include both environmental and personal barriers to physical activity (Bandura, 1997). Environmental barriers are those that are oftentimes beyond a person's direct control (e.g. weather, lack of transportation; Salmon, Owen, Crawford, Bauman, & Sallis, 2003). Personal barriers, on the other hand, are 'internal' and include barriers such as being too tired or having health issues (McSweeney & Coon, 2004). Both environmental and personal barriers are negatively related to the amount of physical activity in which individuals engage (McSweeney & Coon, 2004; Salmon et al., 2003). Although the impediments that individuals identify might not actually be barriers, per se (e.g. a person says he or she cannot exercise due to lack of transportation despite evidence to the contrary), these perceptions can nonetheless strongly influence behavior (Bandura, 1997).

Self-regulatory behaviors are also important in engaging in regular physical activity (Anderson, Wojcik, Winett, & Williams, 2006; Ziegelmann, Lippke, & Schwarzer, 2006). According to Bandura (2005, p. 246), 'individuals continuously preside over their own behavior'. In other words, regardless of social or environmental motivators, individuals are not likely to engage in or maintain behaviors without developing the self-regulatory behaviors necessary to control their own motivation and behavior. Maes and Karoly (2005) outline three processes underlying self-regulatory behavior: (1) setting goals; (2) enacting these goals; and (3) creating maintenance strategies to sustain behavior. These processes can also be conceptualized as goal setting and planning (Rovniak et al., 2002), both of which are strongly associated with physical activity (e.g. Gillis, Grossman, McLellan, King, & Stewart, 2002; Levetan et al., 2005; Sniehotta et al., 2005).

Outcome expectancies refer to expected results of performing a specific behavior. Bandura (1997) suggests that when outcomes depend greatly upon performance, people tend to judge the expected outcomes in terms of how well they feel they can perform the task. In cases such as this, outcome expectancies tend to partially mediate the relation between self-efficacy and behavior (Bandura, 1997). In general, this relation holds true for health-related behaviors such as weight management (Shannon, Bagby, Wang, & Trenker, 1990) and

exercise (Anderson et al., 2006; Resnick, 2001; Resnick et al., 2000).

Social support is another important construct in the social cognitive theory (Bandura, 1997). Bandura suggests that the social support acts on physical activity primarily through self-efficacy. Specifically, increased levels of social support tend to lead to higher feelings of self-efficacy, which, in turn, lead to increased levels of physical activity. Anderson et al. (2006) found that family support was indeed indirectly related to physical activity though self-efficacy and self-regulatory behaviors. Likewise, Rovniak et al. (2002) found social support was indirectly related to physical activity through self-efficacy. In order to more fully examine specific paths through which social support might be related to physical activity, the current study examined the relationships between social support and all of the components of the social cognitive theory.

Evidence suggests that each component of the social cognitive theory is related to physical activity (Anderson et al., 2006; Resnick et al., 2000). However, relevant to the current study, few studies have examined the associations among all of these constructs with physical activity simultaneously, particularly in middle-aged and young-old adults, and many focus primarily on self-efficacy and do not consider the pathways through which self-efficacy is related to behavior (Armitage & Conner, 2000). Rovniak and colleagues (2002) examined the relationships among social support, self-efficacy, self-regulatory behaviors, outcome expectancies and physical activity. Using structural equation modeling to examine data collected from university students, the results indicated that the relationship between social support and physical activity was completely mediated by self-efficacy. Self-efficacy was directly and indirectly related to physical activity through outcome expectancies and self-regulatory behaviors. In addition, increased self-regulatory behavior directly related to increased levels of physical activity. Contrary to the social cognitive theory, however, outcome expectancies were not significantly related to physical activity. Although this study did not include perceived barriers, in the model, it did include negative outcome expectancies, which included items related to concerns about the time needed to exercise and the change in routine that is necessary to engage in regular physical activity. In a study examining health, outcome expectancies and self-efficacy, Resnick (2001) found that self-efficacy, physical health and outcome expectancies were directly related to the current exercise level of older adults in a continuing care retirement community. Although these results were consistent with the social cognitive theory, the final model did not include self-regulatory behaviors or perceived barriers.

The primary objective of this study was to examine the full social cognitive model in terms of how well it accounts for variance in physical activity levels among middle-aged and young-old adults. Specifically, we examined how the constructs of the social cognitive model (i.e. social support, self-efficacy, perceived barriers, outcome expectancies and self-regulatory behaviors) were related to physical activity, while also considering number of health conditions, sex and age. A hypothetical model was specified and tested, where: (1) social support was related to self-efficacy; (2) self-efficacy was specified to be related to perceived barriers, outcome expectancies, self-regulatory behaviors and physical activity; (3) perceived barriers and outcome expectancies were related to self-regulatory behavior; and (4) self-regulatory behavior was related to physical activity.

Method

Participants

Community-dwelling long-term married couples between the ages of 50 and 75 living in the Mid-Atlantic region of the United States were recruited to participate through referrals from undergraduate students and other participants. Data were collected during the fall and winter of 2006. Study packets were sent to 236 couples (N = 472 individuals). Overall, 272 individual packets were returned (59% return rate), of which, 256 were from individuals whose spouse also returned his or her packet (i.e. 128 couples). Twelve couples were excluded from the analyses because: (a) one or both spouses were younger than 50 or older than 75 (n = five couples); (b) the couple was married for fewer than 15 years (n = four couples); (c) one or both of the spouses were missing more than 50 percent of the data (n = two couples); and (d) participants displayed obvious response biases (i.e. circled the same response on multiple measures, including those with reverse-coded items; n = one couple). Participants who returned their packets were entered into four $50 raffles.

Measures

Material packets were sent to participants shortly after the mailing of a postcard informing them that they were referred to participate in the study. Each packet included two sets (one for the husband and one for the wife) of the following: the questionnaire packet, two copies (one for the participant to keep, one to return) each of a HIPAA (Health Information Portability and Accountability Act) authorization form and an informed consent form and two self-addressed stamped envelopes to the return the material. Participants were asked to sign a form stating that they completed their questionnaires separately and two return envelopes were included to promote independent completion of the materials. Descriptive information, including the internal reliability of the measures, is presented in Table 1.

Demographics The demographic questionnaire collected data regarding length of marriage, age, sex, education, income, health information (i.e. self-rated health and number of doctor visits in past six months) and functional ability.

Chronic health conditions Chronic health conditions were assessed using the National Long-term Care Survey (National Center for Health Statistics, 1982). Participants were asked if they had been diagnosed with any of 31 listed conditions (e.g. arthritis, asthma, diabetes) during the past year. The number of conditions was summed to create an index of physical health (observed range = 0 to 6).

Self-efficacy Self-efficacy was assessed using two measures. The nine-item barrier self-efficacy scale assessed individuals' confidence that they could overcome barriers that may limit engagement in physical activity (Resnick et al., 2000). Each item began with the stem, 'How confident are you right now that you could exercise three times per week for 20 minutes if …' Barriers listed on the scale include bad weather, being bored with the activity, experiencing pain, absence of an exercise partner, lack of enjoyment, time constraints, tiredness, being stressed and feeling depressed. Responses to the items ranged from 1 (*not at all confident*) to 10 (*very confident*), with the mean of the nine items indicating overall barrier self-efficacy (observed range 1 to 10).

The second self-efficacy measure was a task-related self-efficacy scale (Bray & Cowan, 2004). This nine-item measure asked participants to rate their confidence (0% = *not at all confident* to 100% = *completely confident*) in their capability to engage in physical activity continuously for increasing increments of time (from five minutes to 45 minutes, totaling nine increments). For example, a person might report feeling 100 percent confident that he or she can engage in physical activity continuously for five minutes, 95 percent confident for 10 minutes and so on. Responses to the items were averaged, resulting in a possible range of 0–100 percent (observed range 31.33% to 100%).

Social support The amount of social support participants reported receiving from their families was assessed using the 15-item Positive Social Influence Scale (Chogahara, 1999). Participants were asked how often in the past 12 months (0 = *never*, 4 = *very often*) that their families provided companionship support (e.g. made plans to do a physical activity together), informational support (e.g. explained why physical activity is important for health) and esteem support (e.g. told you that you should be proud of your physical activity skills). Scores on these items were averaged, resulting in a possible range of 0 to 4 (observed range 0 to 3.67).

Outcome expectancies The Benefits of Physical Activity Scale (BPA) consists of 12 positive outcomes of physical activity (Rogers et al., 2005; Sallis et al., 1985). Participants were asked to rate the likelihood of these outcomes if they would participate in regular exercise (e.g. 'I will improve my heart and lung function', 'It will help me concentrate better') on a scale of 1 (*not at all likely*) to 5 (*extremely likely*). These values were then averaged, resulting in an overall positive outcome expectancy score (observed range 0 to 5).

Self-regulatory behaviors Two components of self-regulatory behavior, planning and goal-setting, were measured. The Exercise Planning and Scheduling Scale (EPS) included 10 items related to how people plan and schedule physical activity (e.g. 'I schedule exercise at specific times each week') (Rovniak et al., 2002). Participants were asked to indicate how well each item described him or herself on a scale of 1 (*does not describe me*) to 5 (*completely describes me*). The responses were averaged across the items (observed range 1 to 4.30).

The second measure of self-regulatory behavior was the Exercise Goal-Setting Scale (EGS; Rovniak et al., 2002). This 10-item scale assessed three components of goal setting: (1) goal development; (2) self-monitoring; and (3) problem solving.

Table 1. Descriptive statistics for demographic and study variables ($N = 232$)

	Total			*Husbands*		*Wives*		*Difference Test*	
Variable (scale)	*M*	*SD*	α	*M*	*SD*	*M*	*SD*	*t*	*p*
Age (years)	58.86	7.16	n/a	60.08	7.26	57.65	6.86	8.71	.00
Education (years)	13.90	2.01	n/a	14.01	2.18	13.79	1.84	0.61	.40
Length of marriage (years)	34.53	9.90	n/a	–	–	–	–	–	–
# of health conditions	2.14	1.96	n/a	2.07	1.91	2.22	2.02	–0.70	.49
# IADL impairments	0.41	0.89	n/a	0.40	0.90	0.43	0.89	–0.27	.79
Self-rated physical health (1–5)	4.86	0.85	n/a	4.87	0.79	4.84	0.91	0.23	.82
# of doctor visits (past 6 mo)	2.10	2.65	n/a	1.92	2.24	2.28	3.01	–1.04	.30
Self-efficacy									
Barrier self-efficacy (1–10)	5.95	2.28	0.93	6.06	2.26	5.84	2.31	0.85	.40
Task self-efficacy (1–100)	83.21	20.82	0.96	82.69	21.27	83.73	20.44	–0.51	.61
Perceived social support	1.81	0.89	0.92	1.72	0.91	1.90	0.87	–1.27	.22
Self-regulatory behavior									
Goals (1–5)	1.63	0.82	0.94	1.60	0.79	1.66	0.85	–0.64	.52
Planning (1–5)	2.64	0.68	0.77	2.53	0.62	2.75	0.72	–2.82	.01
Barriers (1–5)	2.02	0.58	0.80	1.97	0.58	2.06	0.57	–1.26	.21
Outcome expectancies (1–5)	3.62	0.79	0.93	3.48	0.84	3.76	0.74	–2.67	.01
Physical activity									
PAQ total (kCal/week)	1839.70	1564.73	n/a	1920.62	1604.38	1758.78	1526.71	0.93	.35
YPAS activity dimension (0–128)	52.30	29.19	n/a	53.06	27.07	51.53	31.26	0.50	.62
Walking (minutes/month)	261.38	328.77	n/a	223.22	298.33	299.54	353.81	–2.11	.04

Notes: IADL = Instrumental activities of daily living; PAQ = Paffenbarger Activity Questionnaire (Paffenbarger, Wing, & Hyde, 1978); YPAS = Yale Physical Activity Survey (DiPietro, Caspersen, Ostfield, & Nadel, 1993)

Participants responded to items on a scale of 1 (*does not describe me*) to 5 (*completely describes me*). Scores were averaged across the 10 items (observed range 1 to 3.70).

Perceived barriers to exercise The Perceived Barriers to Exercise Scale assessed personal and environmental barriers (Salmon et al., 2003). Participants were asked to rate the extent to which they agreed or disagreed with 18 statements asking how much a particular barrier (e.g. cost, age, lack of time) interfered with engaging in physical activity on a five-point scale (1= *is not a barrier* to 5 = *very much a barrier*). Responses were averaged across the 18 items (observed range 1 to 4.83).

Physical activity The amount of physical activity in which participants engaged was assessed with three measures: the Paffenbarger Physical Activity Questionnaire (PAQ; Paffenbarger et al., 1978); the Yale Physical Activity Survey (YPAS; DiPietro et al., 1993); and a self-report walking measure (National Center for Health Statistics, 1993).

The PAQ (Paffenbarger et al., 1978) contains three components regarding activities performed during the previous week: (1) the average number of flights of stairs climbed per day; (2) the average number of blocks walked per day; and (3) an open-ended question regarding the frequency and duration of other sports or physical activity in which the person engaged. Responses to the open-ended question were then multiplied by established energy expenditure (in kilocalories) guidelines (Paffenbarger et al., 1978). For example, fishing was assigned a value of 3.5 kcal/minute, while jogging was assigned a value of 7.0 kcal/minute. All values were converted and summed to create an index that estimated the average energy expenditure per week (kcal/week) of each participant (observed range 0 to 5805). This measure has been validated using the more objective measure of maximum oxygen uptake (r = .60; Ainsworth, Leon, Richardson, Jacobs, & Paffenbarger, 1993).

The second measure of physical activity was the activity dimension score from the Yale Physical Activity Survey (DiPietro et al., 1993). This measure required participants to report the frequency and duration of activity across five different physical intensity levels: vigorous activity, leisurely walking, any type of moving on feet, standing on feet and sitting. For the vigorous activity, leisurely walking and moving on feet dimensions there was one item assessed frequency and another item assessed duration of activity at that level. Frequency and duration were multiplied together and this product was multiplied by a weighting factor (5—vigorous activity, 4—walking, 3—any type of moving on feet). The standing on feet and sitting dimensions was assessed with one item asking how long the participant stood on his or her feet (or sat down) on an average day in the previous month. This response was then multiplied by a weighting factor (2—standing on feet, 1—sitting). A total score was derived from the five weighted subscales, with a possible range of 0 to 128 (observed range 6 to 123). Previous research suggested that this index is related to more objective measures of physical activity such as maximal oxygen consumption (r = .58) and data collected from accelerometers (r = .37; DiPietro et al., 1993).

The third measure of physical activity assessed the extent to which participants walked for exercise and asked about: (a) the total number of times the participant walked for exercise during the previous month; and (b) the average amount of time the participant walked on each of the occasions that they did walk for exercise (National Center for Health Statistics, 1993). The frequency and duration items were multiplied to create an index of number of minutes walked for exercise per month (observed range 0 to 1106). Scores on this index were found to be significantly correlated with the number of minutes walked reported in a participant-kept diary (r = .61; Johnson, Sallis, & Hovell, 2000).

Data analysis

The primary data analysis examined the social cognitive model within a structural equation modeling framework. Self-efficacy, self-regulatory behaviors and physical activity were represented by multiple indicators, while social support, barriers and outcome expectancy scores were represented by only one indicator. Error was estimated for these single-indicator variables by specifying the error variance as $1–\alpha$ (Kline, 2005). Age, sex (coded Male = 0, Female = 1) and number of health conditions were also included in the models as observed variables. Error for these single-item indicators was specified as the measure's variance multiplied by estimated error.

The models were estimated using maximum likelihood estimation. Model fit was assessed with the chi-square goodness-of-fit statistic, root mean square error of approximation (RMSEA; Kline, 2005) and the comparative fit index (CFI; Browne & Cudeck, 1993). RMSEA values close to 0.06 or less indicate

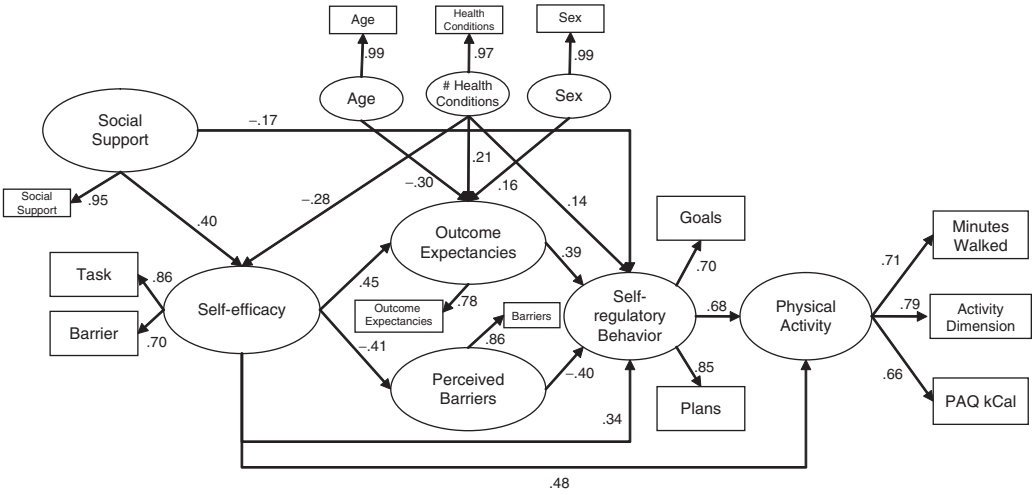

Figure 1. Final social cognitive model (N = 232) showing only significant paths. All path estimates are standardized. Final model fit, $\chi^2(63) = 125.73$, $p = .00$, CFI = .950, RMSEA = .059.

adequate model fit (Brown & Cudeck, 1993; Hu & Bentler, 1995), while CFI values greater than 0.95 generally indicate adequate model fit (Bentler, 1990). The chi-square goodness-of-fit index is also reported. However, because of the sensitivity of this statistic to sample size a significant value is not necessarily a reason to conclude that the model does not fit well (Kline, 2005). In order to test the social cognitive model (see Fig. 1), direct and indirect paths were estimated. All analyses were performed using Mplus Version 4.1 (Muthén & Muthén, 1998–2006).

Results

Descriptive statistics

Descriptive statistics for the all study variables are presented in Table 1. On average, participants had approximately 14 years of education and were married for about 34 years. In terms of physical health, participants reported an average of 2.14 health conditions (SD = 1.96), 0.41 IADL impairments (SD = 0.89), 2.10 doctor visits during the previous six months (SD = 2.65) and rated their health as very good on a 1 to 5 scale (M = 4.86, SD = 0.85). With regard to gender differences, men were significantly older, reported less planning, had less positive outcome expectancies and reported fewer minutes walking compared to women (see Table 1).

The correlation matrix of the variables in the model is presented in Table 2. The correlations among the variables provide preliminary evidence of the associations among the study variables. The strongest correlations are among variables measuring the same constructs (e.g. the correlation between the three measures of physical activity).

Structural equation model

Model fit The model fit the data well, $\chi^2(37) = 69.99$, $p = .00$, CFI = .96, RMSEA = .06 and accounted for 71 percent of the variance in physical activity (Fig. 1).

Direct, indirect and total effects There were a number of direct and indirect relationships among the study variables (see Table 3 for direct, total indirect and total effects). Indirect effects were tested with the MODEL INDIRECT command in Mplus (Muthén & Muthén, 1998–2006). Increased social support was directly related to higher self-efficacy ($\beta_{direct} = .40$) and increased self-regulatory behaviors ($\beta_{direct} = .17$). The total effect of social support on self-regulatory behavior ($\beta_{total} = .43$) was largely indirect through self-efficacy ($\beta_{indirect} = .26$). Specifically, the indirect relationship between social support and self-regulatory behavior primarily through self-efficacy ($\beta_{indirect} = .13$). Social support also had a total effect on outcome expectancies ($\beta_{total} = .33$), but this relationship was primarily indirect through self-efficacy ($\beta_{indirect} = .18$, $\beta_{direct} = .15$). Social support had an indirect effect on perceived barriers through self-efficacy ($\beta_{indirect} = -.16$).

Table 2. Intercorrelations among variables ($N = 232$)

Variable	*1*	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9*	*10*	*11*	*12*
Covariates												
1. Sex												
2. Age	−.17**											
3. Health conditions	.02	.31**										
Self-efficacy (SE)												
4. Task	−.03	−.17**	−.23**									
5. Barrier	−.05	−.01	−.23**	.60**								
Social support												
6. Social support	.07	.02	−.01	.33**	.27**							
Outcome expectancies												
7. Outcome expectancy	.17**	−.23**	−.01	.27**	.30**	.24**						
Self-regulatory behavior												
8. Planning	.14*	−.03	.06	.27**	.39**	.24**	.33**					
9. Goals	−.04	−.02	.01	.32**	.40**	.37**	.28**	.50**				
Barriers												
10. Barriers	.09	−.01	.21**	−.19**	−.33**	−.06	−.01	−.35*	−.28			
Physical activity												
11. YPAS activity dimension	−.03	.04	−.09	.42**	.50**	.35**	.26**	.43**	.35**	−.22**		
12. PAQ Kcal/month	−.05	−.08	−.05	.40**	.43**	.30**	.12	.31**	.25**	−.17**	.50**	
13. Minutes walked/month	.12	.06	.02	.36**	.38**	.22**	.16*	.31**	.29**	−.15*	.52**	.44**

Notes : YPAS = Yale Physical Activity Survey (DiPietro et al., 1993); PAQ = Paffenbarger Activity Questionnaire (Paffenbarger et al., 1978)
*$p < .05$; **$p < .01$

Table 3. Standardized direct, total indirect and total effects

Variable	*Age*	*Sex*	*Health conditions*	*Social support*	*Self-efficacy*	*Outcome expectancies*	*Perceived barriers*	*Self-regulatory behavior*
Social support								
Direct	.03	−.04	−.02					
Total indirect								
Total	.03	−.04	−.02					
Self-efficacy								
Direct	.02	−.05	−.28***	.40***				
Total indirect	.01	−.02	−.01					
Total	.03	−.07	−.29***	.40***				
Outcome expectancies								
Direct	−.30***	.16*	.21*	.15	.45***			
Total indirect	−.02	−.02	−.13*	.18***				
Total	−.32***	.14	.08	.33***	.45***			
Perceived barriers								
Direct	−.07	.08	.16**	.09	−.41***			
Total indirect	−.01	.02	.12**	−.16**				
Total	−.08	.10	.28**	−.07	−.41***			
Self-regulatory behavior								
Direct	−.03	.07	.10	.17*	.34**	.39**	−.40***	
Total indirect	.05	−.01	−.18**	.26***	.34**			
Total	.02	.06	−.08	.43***	.68***	.39***	−.40***	
Physical activity								
Direct	.05	−.02	.06	.05	.48**	.16	−.15	.68**
Total indirect	.01	.01	−.15	.34***	.24**	.26**	−.27**	
Total	.06	−.01	−.09	.39***	.72***	.42***	−.42***	.68**

$p < .05$; $^{**}p < .01$; $^{***}p < .001$

However, the total effect was not significant (β_{total} = –.07, β_{direct} = .09). Finally, social support had a total effect on physical activity (β_{total} = .39), but this relationship was almost entirely indirect ($\beta_{indirect}$ = .34, β_{direct} = .05). Specifically, the relationship between social support and physical activity was through self-efficacy ($\beta_{indirect}$ = .19), and self-efficacy and self-regulatory behavior ($\beta_{indirect}$ = .09).

Higher self-efficacy was directly related to more positive outcome expectancies (β_{direct} = .45) and fewer perceived barriers (β_{direct} = –.41). In addition, self-efficacy was directly (β_{direct} = .34) and indirectly related to self-regulatory behaviors through outcome expectancies ($\beta_{indirect}$ = .18), and perceived barriers ($\beta_{indirect}$ = .16; β_{total} = .68). Self-efficacy was also directly (β_{direct} = .48) and indirectly related to physical activity ($\beta_{indirect}$ = .24; β_{total} = .72). Examination of specific indirect paths suggested three significant indirect paths: (1) self-efficacy to physical activity through self-regulatory behavior ($\beta_{indirect}$ = .23); (2) self-efficacy to physical activity through outcome expectancies and self-regulatory behavior ($\beta_{indirect}$ = .12); and (3) self-efficacy to physical activity through perceived barriers and self-regulatory behavior ($\beta_{indirect}$ = .11).

The relationship between outcome expectancies and physical activity was primarily indirect ($\beta_{indirect}$ = .26; β_{total} = .42). In fact, the direct path between outcome expectancies and physical activity was not significant. Likewise, the relationship between perceived barriers and physical activity was indirect ($\beta_{indirect}$ = –.27; β_{total} = –.42), with the direct path not reaching significance.

There were a number of significant associations involving the covariates in this model. Number of reported health conditions was directly and negatively related to self-efficacy (β_{direct} = –.28). In addition, number of reported health conditions was directly (β_{direct} = .21) and indirectly ($\beta_{indirect}$ = –.13) related to outcome expectancies through self-efficacy. However, because of the different directions of the direct and indirect effects, the total effect was not significant (β_{total} = .08). Increased number of health conditions was also directly (β_{direct} = .16) and indirectly related to perceived barriers ($\beta_{indirect}$ = .12). The total effect of health conditions on perceived barriers was significant (β_{total} = .28). Health conditions had a negative indirect effect on self-regulatory skills ($\beta_{indirect}$ = –.18), but because of a positive direct effect ($\beta_{indirect}$ = .10) the total effect was not significant (β_{total} = –.08). Males were more likely to report more positive outcome expectancies ($\beta_{indirect}$ = .16), but a small indirect effect ($\beta_{indirect}$ = –.02) resulted in a non-significant total effect ($\beta_{indirect}$ = .14). Finally, there was a significant direct relationship between increasing age and less positive outcome expectancies (β_{direct} = –.30).

Discussion

This study provided a test of how well self-efficacy, perceived barriers, outcome expectancies, self-regulatory skills and social support accounted for variability in the physical activity of middle-aged and young-old adults while also considering age, sex and number of reported health conditions. The results indicate that the theoretically driven model accounted for approximately 66 percent of the variance in physical activity.

Self-efficacy was directly associated with all of the social cognitive constructs and physical activity. Additionally, self-efficacy was indirectly related to self-regulatory behavior through perceived barriers and outcome expectancies. Self-efficacy was indirectly related to physical activity through outcome expectancies, perceived barriers and self-regulatory behavior. In general, people with higher self-efficacy held more positive views of the outcomes of exercise, perceived fewer barriers, engaged in more self-regulatory behavior and reported more physical activity than people with lower self-efficacy. These findings are congruent with previous research (Allison & Keller, 2004; McAuley, Courneya, Rudolph, & Lox, 1994) and suggest that physical activity interventions targeting self-efficacy could have an impact both directly and through associations with other social cognitive variables.

The results of this study elucidate prior inconsistent findings regarding the associations of perceived barriers and outcome expectancies with physical activity. Outcome expectancies and barriers have been found to be both related and unrelated to physical activity (Resnick et al., 2000; Salmon et al., 2003). However, these studies examined direct associations. Our findings suggest that the associations of barriers and outcome expectancies with physical activity are primarily indirect. Specifically, people who perceive many barriers and do not expect positive outcomes from engaging in physical activity are not likely to have physical activity-related plans and goals. In turn, it is these self-regulatory behaviors that ultimately guide behaviors such as engaging in physical activity (Anderson et al., 2006; Bandura, 2004).

Self-regulatory behavior was directly related to physical activity. Our model suggests that self-regulatory behaviors are indeed important in accounting for variability in physical activity and may be an effective target of future interventions aimed at increasing physical activity.

Increased social support was directly related to increased self-efficacy and increased self-regulatory behavior. These findings are consistent with the social cognitive theory (Bandura, 1997) and previous research (Anderson et al., 2006; Resnick, 2001). Social support was also indirectly related to outcome expectancies and self-regulatory behaviors through its relationship with self-efficacy. In addition, the relationship between social support and physical activity was almost entirely indirect. These results suggest that interventions that focus on increasing social support for physical activity act indirectly through other social cognitive constructs.

Our results indicated a number of relationships among demographic variables and social cognitive constructs. Females held more positive outcome expectancies compared to males. Although relatively small in magnitude, this finding suggests that interventions based on the social cognitive model should consider sex differences in this construct. The number of reported health conditions was positively related to perceived barriers and outcome expectancies. This finding suggests that although people who report more chronic health conditions report more barriers to engaging in physical activity, they also appear to recognize the positive health benefits of exercise. One possibility is that people who reported more chronic health conditions were more likely to receive advice regarding physical activity from their physician (Dishman, 1994), resulting in an increased awareness of the health benefits. Age, sex or number of reported health conditions were not related to physical activity.

When interpreting the results of the current study, several caveats should be considered. First, 98 percent of the sample was White, thus limiting the generalizability of the results. Second, all of the measures were self-report. However, the measures were carefully selected and have been validated in previous research. The third limitation is that some of the latent factors only have two indicators, which may result in unreliable error estimates. Fourth, because the data were collected from couples, dependency in the data is likely. Although separate analyses for men and women found identical patterns of relationships among the constructs, future research with a larger sample of couples might take a more dyadic approach to testing the social cognitive model in long-term married couples. Finally, the data in this study were cross-sectional, thereby limiting the causal interpretations that can be made. The results, however, are consistent with the social cognitive theory (Bandura, 1997), thus providing a foundation for future research that can verify the associations among the social cognitive constructs specified by this study.

Conclusion

Overall, our results indicated that personal, social and environmental factors are related to physical activity. This study demonstrated the importance of examining the constructs of the social cognitive model simultaneously, while also considering demographic variables. Despite the cross-sectional nature of the results, this study provides a basis for further research examining correlates of physical activity in middle-aged and young-old adults, as well as possible targets for interventions (e.g. encouraging self-regulatory behaviors, emphasizing the positive outcomes of physical activity, decreasing perceived environmental and personal barriers, increasing self-efficacy) designed to increase the amount of physical activity in which middle-aged and young-old adults engage.

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